CLAIMS

Having thus described the preferred embodiments, the invention is now claimed to be:

1. A radio frequency coil system **(38)** for magnetic resonance imaging, the coil system **(38)** comprising:

a plurality of parallel spaced apart rungs **(60)** which each includes rung capacitors **(68)**;

an end cap **(64)** disposed at a closed end **(66)** of the coil system **(38)**; and

an RF shield **(62)** which is connected to the end cap **(64)** and surrounds the rungs **(60)** extending in a direction substantially parallel to rungs **(60)**.

2. The coil system as set forth in claim 1, wherein the RF shield **(62)** is partially or wholly constructed of electrically conductive mesh or other conductive material with properties of at least partial optical transparency in a wavelength range of human vision.

3. The coil system as set forth in claim 1, further including:

an end ring **(78)** disposed at an closed end **(66)** of the coil system **(38)** and being coupled to the rungs **(60)**, the end ring having capacitors **(80)** between neighboring rungs.

4. The coil system as set forth in 3, wherein the rungs **(60)** are directly connected to the RF shield **(62)** at an open end **(72)**.

5. The coil system as set forth in claim 1, further including:

an end ring **(70)** disposed at an open end **(72)** of the coil system **(38)** and being coupled to the rungs **(60)**, the end ring having capacitors **(74)** between neighboring rungs.

6. The coil system as set forth in claim 5, wherein each pair of neighboring rungs **(60)** is further coupled through closed end capacitors **(80)** to define individual independent current loops or meshes.

7. The coil system as set forth in claim 6, wherein the capacitors **(68, 74)** are selected to decouple the current loops or meshes to define a transmit/receive coil array forming a plurality of individual transmit/receive channels, such that each loop has selected phase and amplitude characteristics.

8. The coil system as set forth in claim 5, wherein at least one of the end ring **(70)** and the rungs **(60)** are capacitively coupled to the RF screen adjacent the open end via capacitors **(92)** to define a current path through the RF screen **(62)**.

9. The coil system as set forth in claim 8, wherein the coil system **(38)** is a transmit/receive coil and a volume coil.

10. The coil system as set forth in claim 9, further including:

inductors **(100)** connected between at least one of the end ring **(70)** and the rungs **(60)** to define a third resonance mode.

11. The coil system as set forth in claim 5, wherein the rung and end ring capacitors **(68, 74)** are selected to tune the coil system **(38)** to a resonance frequency in one of:

a low-pass mode,
a high-pass mode, and
a bandpass mode.

12. The coil system as set forth in claim 1, wherein the rungs **(60)** are directly connected to the end cap **(64)**.

13. The coil system as set forth in claim 1, wherein the rungs **(60)** are capacitively coupled to the RF screen **(62)**.

14. The coil system as set forth in claim 1, wherein pairs of the rungs **(60)** are coupled by open end capacitors **(74)** to define individual meshes **(82)** and further including:

couplings **(86)** coupled to adjacent meshes **(82)**, the couplings including one of:

capacitive decouplings,
inductive decouplings,
impedance transformers **(88)**, and
overlapping portions of the individual meshes **(82)**.

15. The coil system as set forth in claim 14, wherein the coil system **(38)** is tuned by the rung capacitors **(68)**, the open end capacitors **(74)**, and the couplings **(86)** to one of a volume mode and a SENSE mode.

16. The coil system as set forth in claim 15, wherein the couplings **(86)** include switching components for selectively switching between the volume mode and the SENSE mode.

17. The coil system as set forth in claim 16, wherein each rung **(60)** is directly connected to the end cap **(64)** and each mesh **(82)** includes the end ring capacitor **(74)** disposed at an open end **(72)** of the coil system **(38)**.

18. The coil system as set forth in claim 17, wherein each pair of the rungs **(60)** of each mesh **(82)** is further coupled by a closed end capacitor **(80)** to define individual independent current loops.

19. A method of using the coil system **(38)** of claim 1 comprising:

coupling an end ring to an open end of the coil system, the end ring having open end capacitors **(74)** between neighboring rungs to define a bandpass mode.

20. The method as set forth in claim 19, further including:

coupling each pair of neighboring rungs through closed end capacitors **(80)** to define individual independent current loops; and

proportioning the strip and open end capacitors **(68, 74)** to decouple the current loops to define a transmit/receive coil array.

21. The method as set forth in claim 19, further including:

capacitively coupling at least one of the end ring and the rungs to the RF screen adjacent the open end via capacitors **(92)** to define a current path through the RF screen; and

tuning the capacitors **(92)** to a high resonance frequency to define a dual resonance mode, wherein the coil system is a transmit/receive coil and a volume coil.

22. The method as set forth in claim 19, further including:

coupling pairs of the rungs by open end capacitors **(74)** to define individual meshes **(82)**;

coupling adjacent meshes by one of:

capacitive couplings,

inductive couplings,

impedance transformers **(88)**, and

overlapping portions of the individual meshes.

23. The method as set forth in claim 19, further including:

tuning the coil system **(38)** by the rung capacitors **(68)**, the open end capacitors **(74)**, and the couplings **(86)** to one of a volume mode and a SENSE mode.

24. A magnetic resonance imaging scanner **(10)** including:

a magnet **(20)** producing a main magnetic field;

a plurality of magnetic field gradient coils **(30)** arranged to produce magnetic field gradients to the main magnetic field; and

the radio frequency coil system **(38)** as set forth in claim 1, the rungs **(60)** extending in a direction substantially parallel to the main magnetic field.